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ABSTRACT

Major technological changes are occurring primarily in three fields: telecommunications, computer applications, and advanced manufacturing technology. High technology is having a great impact on every aspect of the labor market. Most new jobs will not be in the high technology field, however, and the newly created occupations will not require a substantial increase in job skills. According to some experts, that is because high technology is based on a reduction in the skilled labor force. Others argue that some businesses and industries have failed to gain a competitive edge through adoption and adaptation of new technology. Consequently, they are becoming obsolete. Vocational education has a vital role in collaborating with business and industry in high technology training and retraining to upgrade workers with the emerging new occupational skills and to maintain a competitive edge. Vocational education is facing the challenge of producing workers who can manage, operate, manufacture, test, design, program, install, maintain, and repair high technology products and processes. Educators should consider five phases in the construction of successful high technology programs: long-range planning, program planning, development, implementation, and evaluation and refinement. (YLB)

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ERIC® DIGEST NO. 37

OVERVIEW

Clearinghouse on Adult, Career, and Vocational Education

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EDUCATION FOR HIGH-TECHNOLOGY JOBS

The development of new technologies and their adoption by business and industry are having a major impact on labor force distribution and labor demand. With technological changes occurring in telecommunications, computer applications, and advanced manufacturing technology, production processes and service delivery systems are achieving higher productivity, greater efficiency, and lower costs. Business and industries that have failed to adopt technological innovations are losing their competitive edge. Vocational educators are facing the challenge of training a labor force that can successfully work with the new technology through five phases: long-range planning, program planning, development, implementation, and evaluation and refinement.

What Trends Are Altering the Labor Force?

Major technological changes are occurring primarily in three fields: telecommunications, computer applications, and advanced manufacturing technology (Faddis, Ashley, and Abram 1982; Abram et al. 1983). Examples of technological innovations under each of these fields of technological advancement are described by Faddis, Ashley, and Abram (1982) as follows:

- **Telecommunications**—In this rapidly changing field, many technological innovations are being developed: data networks, satellite and digitally encoded telephone and telecopy devices and systems, optical fibers and cables, electronic mail and shopping services, and electronic funds transfer systems. As business and industry adopt these technologies, only a few new occupations are expected to emerge (e.g., laser technicians), although no current occupations are expected to vanish from the telecommunication industry. However, changes are taking place in the job skills needed for telecommunications occupations. The computerization of most of the manufacturing and installation jobs tends to lower the mechanical skills required. However, the demand for computer programming skills is expected to increase.

- **Computer Applications**—Technological advancement in the microprocessor industry has a multidimensional impact on all of the fields of technological innovation. New applications of computer technologies such as optical scanners, electrostatic printers, and laser-imaged discs have revolutionized the areas of data processing, information storage and retrieval, and word processing. Computer applications have become vital criteria of efficiency, productivity, and access for many industries (e.g., banks, insurance firms, automobile manufacturers, health care institutions, and libraries). As a result of these technological changes, many occupations are emerging and becoming more important (e.g., word processing specialist, computer programmer, analyst, and records management technicians). These new computer-related occupations have replaced or reduced labor demand for office workers. However, new jobs are expected to emerge in information-processing occupations.

- **Advanced Manufacturing Technology**—"Today's advanced manufacturing technologies make use of sophisticated design, fabrication, assembly, finishing, and quality control equipment incorporating microprocessor- driven control systems, lasers, programmable computerized robots, optical scanners, and an enormous array of new materials and processes" (Faddis, Ashley, and Abram 1982, p. 14). These technologies are designed and adopted as control mechanisms to increase accuracy, efficiency, and safety and to reduce labor costs per manufactured unit. Consequently, many semiskilled and skilled occupations are being eliminated entirely, such as pattern-cutters and sewing machine operators in the textile industry. However, these authors note that some manufacturing technician jobs are emerging, requiring skills in laser operation, computer programming, and numerical control systems maintenance and repair.

What Occupational Trends Are Emerging?

The automation of production processes and of service delivery systems is designed to achieve higher productivity and greater efficiency at a lower cost. The new technological innovations are based on the use of more complex computer systems (1) to receive, display, and transmit information and (2) to control processes, machines, and manufacturing devices. In essence, that is what high technology is all about (Abram, Rose, and Landrum 1983).

High technology is having a great impact on every aspect of the labor market. Most new jobs will not be in the high-technology field, however, and the newly created occupations will not require a substantial increase in job skills (Faddis, Ashley, and Abram 1982; Rumberger 1984). That is because, as some authors argue, high technology is based on a reduction in the skilled labor force (Rumberger 1984).

Other authors argue that some businesses and industries have failed to gain a competitive edge through the adoption

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and adaptation of new and current technology. Consequently, these industries are becoming obsolete because of the foreign competition and the rising costs of energy, labor, and materials (Abram et al. 1982). Vocational education has a vital role to play in collaborating closely with business and industry in the areas of high-technology training and retraining in order to upgrade workers with the emerging new occupational skills and to maintain a competitive edge (Abram et al. 1982; Abram, Rose, and Landrum 1983; and Ashley, Knopka, and Carrico 1983).

How Can Vocational Education Respond to These Trends?

A report by Abram, Rose, and Landrum (1983) reveals that vocational education (secondary or postsecondary) is facing the challenge of producing workers who can manage, operate, manufacture, test, design, program, install, maintain, and repair high-technology products and processes. These nine skill areas ought to be within the scope of any educational program to serve the needs of business and industry. The authors urge educators to work closely with different high-technology industries to identify the nature of the required skills in each training program. Further, Abram, Rose, and Landrum (1983) suggest the consideration of five phases in the construction of successful high-technology programs. These phases and functions follow:

- **Phase 1. Long-range Planning**—Establishing a High-Technology Advisory Council is a primary step to increase the effective involvement of business and industrial leaders. During this phase a "Strategic Planning Process" is suggested in order to identify issues related to the development of a 5-year plan for high-technology programs.

- **Phase 2. Program Planning**—Under the guidance of the High-Technology Advisory Council, program design criteria and performance goals are developed. Then, decisions based on these criteria are made to determine lines of action in relation to the needed skills and knowledge and the establishment of faculty, administrative, and community support.

- **Phase 3. Development**—Conducting and analyzing a needs assessment survey are the most important features of this phase. The survey includes both the employer's and trainees' areas of interest and their ability to determine program specifications (e.g., equipment, skills, facilities).

- **Phase 4. Implementation**—In this phase the following functions are carried out:
  - Ordering equipment and materials
  - Retaining current faculty and/or hiring new faculty
  - Publicizing new programs
  - Occupying and setting up facilities and equipment
  - Preparing detailed course syllabi
  - Conducting orientation for new and/or part-time faculty
  - Providing high-technology counseling
  - Implementing the program(s)

- **Phase 5. Evaluation and Refinement**—This phase involves a continuous review and refinement of the high-technology program's courses, methods, and equipment.

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